

REMARKS

Reconsideration and the timely allowance of the pending claims, in view of the following remarks, are respectfully requested.

By this Amendment, claims 46, 53, 61 and 64 are amended to correct an informality and claims 47, 49, 54 and 56 are cancelled without prejudice or disclaimer to the subject matter therein. No new matter has been added. Accordingly, after entry of this Amendment, claims 46, 48, 50-53, 55 and 57-65 will remain pending in the patent application.

Claims 61, 62, 64, and 65 were rejected under 35 U.S.C. §112, second paragraph, as being allegedly indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The rejection is respectfully traversed.

In connection with the rejection, the Office Action indicates that there is insufficient antecedent basis for the recitation "the plasma chamber." In response, claims 64 and 65 are amended to substitute the recitation "the plasma process" for "the plasma chamber."

Accordingly, reconsideration and withdrawal of the rejection of claims 61, 62, 64, and 65 under 35 U.S.C. §112, second paragraph, are respectfully requested.

Claims 46, 48, 51-53, 55, 58 and 59 were rejected under 35 U.S.C. §102(b) based on JP 01-274398 to Nakahigashi *et al.* (hereinafter "Nakahigashi"), or in the alternative, under 35 U.S.C. §103(a) based on Nakahigashi in view of JP 11-067737A to Koshimizu (the publication of Japanese Patent Application 09-231751). The rejection is respectfully traversed.

Claims 46 and 53 have been amended to recite, *inter alia*, the features of claims 47 and 49 and claims 54 and 56, respectively, which claims have not been rejected under 35 U.S.C. §102(b) based on Nakahigashi, or in the alternative, under 35 U.S.C. §103(a) based on Nakahigashi in view of Koshimizu. Accordingly, this rejection is moot with respect to amended claims 46 and 53.

Claims 48 and 51-52 are patentable over the cited portions of Nakahigashi, Koshimizu and any proper combination thereof at least by virtue of their dependency from claim 46 and for the additional features recited therein.

Claims 55 and 58-59 are patentable over the cited portions of Nakahigashi, Koshimizu and any proper combination thereof at least by virtue of their dependency from claim 53 and for the additional features recited therein.

Accordingly, reconsideration and withdrawal of the rejection of claims 46, 48, 51-53, 55, 58 and 59 under 35 U.S.C. §102(b) based on Nakahigashi, or in the alternative, under 35 U.S.C. §103(a) based on Nakahigashi in view of Koshimizu are respectfully requested.

Claims 47, 49, 54, 56, and 60-65 were rejected under 35 U.S.C. §103(a) based on Nakahigashi, or alternatively, over Nakahigashi in view of Koshimizu, as applied to claims 46 and 53 above, and further in view of U.S. Patent No. 5,614,055 to Fairbairn *et al.* (hereinafter “Fairbairn”). The rejection is respectfully traversed.

Claims 47, 49, 54 and 56 are cancelled without prejudice or disclaimer, thus rendering moot the rejection of these claims.

Claims 60-63 are patentable over the cited portions Nakahigashi, Koshimizu, Fairbairn and any proper combination thereof at least by virtue of their dependency from claim 46 and for the features recited therein. Specifically, claims 60-63 are patentable over the cited portions Nakahigashi, Koshimizu, Fairbairn and any proper combination thereof at least because these claims recite a plasma processing apparatus comprising, *inter alia*, “a gas introducing portion configured to introduce a gas into the process chamber, said gas introducing portion being formed in an annular ring shape;...wherein said gas introducing portion includes: an inlet port through which the gas is introduced into said gas introducing portion; an outlet port through which the gas is evacuated from said introducing portion by said second vacuum device; a gas passage provided in said gas introducing portion and connected to said inlet port and said outlet port, said gas passage being formed as an annular passage; and a plurality of gas nozzles connected to said gas passage, said gas nozzles being entirely formed as second gas passages extending within the gas introducing portion,...” The cited portions of Nakahigashi, Koshimizu and Fairbairn do not present a *prima facie* case of obviousness.

By way of review, the cited portions of Nakahigashi disclose an ECR plasma source that includes a plasma production chamber 1, a process chamber 6 in which a substrate 7 is located, and a gas resolution chamber 12 (identified by the Office Action as the “gas passage” of claim 46), which is positioned between the plasma production chamber 1 and the process chamber 6. *See* Nakahigashi at English abstract and FIG. 1. The gas resolution chamber 12 includes multiaperture electrodes 13, inlets 14 (identified by the Office Action as the “inlet port” of claim 46) and outlets 15 (identified by the Office Action as the “outlet port” of claim 46). *Id.* The gas resolution chamber 12, which is a porous plate, is separated from the process chamber 6 by a multi-aperture electrode 13 for controlling plasma extraction. The

gas resolution chamber 12 is connected symmetrically with a gas introducing part 14 and an exhaust port part 15.

The cited portions of Koshimizu disclose a plasma processing apparatus that includes a plasma generating space 132 and a processing space 134. *See* Koshimizu at FIGS. 4 and 7. The plasma generating space 132 is separated from the processing space 134 by a grid electrode 128 including apertures 128a. *Id.* The cited portions of Koshimizu also disclose that first and second gas supply lines 136, 144 are directly connected to the plasma generating space 132. A vacuum pump evacuates the chamber 102 through evacuating pipe 154.

With this said, and as conceded by the Office Action, the cited portions of Nakahigashi and Koshimizu fail to disclose, teach or suggest that the gas introducing portion and the gas passage are formed as an annular ring shape. The Office Action then relies on Fairbairn as allegedly disclosing, teaching or suggesting these aspects of claim 46. However, there are additional features that are absent in the cited portions of Nakahigashi, Koshimizu and Fairbairn. For example, the cited portions of Nakahigashi, Koshimizu and Fairbairn do not disclose, teach or suggest a plurality of gas nozzles connected to the annular ring shaped passage and that are *entirely formed as second gas passages extending within* the gas introducing portion, which gas introducing portion has an annular shape, as recited in claim 46.

The cited portions of Fairbairn disclose a RF plasma reactor having a gas manifold 100 (identified by the Office Action as the “gas passage” of claim 46) formed in the side wall of the vacuum chamber 102 (identified by the Office Action as the “process chamber” of claim 46). *See* Fairbairn at col. 9, lines 19-35 and FIG. 9. A plurality of pipe-shaped gas supply nozzles 106 are connected to the manifold 100. *Id.* However, unlike claim 46, all of the nozzles 106 of Fairbairn protrude from the inner wall of the chamber 102 and none of them are entirely formed as second gas passages extending within the gas introducing portion. Therefore, any proper combination of the cited portions of Nakahigashi, Koshimizu and Fairbairn cannot result, in any way, in the invention of claim 46.

Equally important is the fact that there is no motivation or suggestion to modify Nakahigashi in view of Koshimizu and Fairbairn. The Office Action asserts that it would have been obvious to form the gas introducing portion and gas passage of Nakahigashi in an annular shape, with the gas passage formed in an inner wall of the process chamber, and the plurality of gas nozzles extending from the gas passage radially around a perimeter of the process chamber to reduce the contact between nozzles and the plasma, thereby reducing the

overheating of the gas introducing means. Applicant strenuously disagrees and submits that **the proposed modification of Nakahigashi would render Nakahigashi's ECR reactor unsatisfactory for its intended purpose.**

Specifically, the ECR reactor of Nakahigashi is intended to reduce the deposition of impurities on the substrate 7. In order to do so, Nakahigashi teaches separating the plasma production chamber 1 from the process chamber 6 with multiaperture electrodes 13 (identified by the Office Action as the “plurality of nozzles” of claim 46, *see* Office Action at page 3) in the form of a porous plate. The multiaperture electrodes 13 of Nakahigashi are thus adapted to shield the process chamber 6 from the plasma and the impurities that are formed outside the process chamber 6. *See* English of Nakahigashi “PURPOSE: To make it possible to reduce the mixture of impurities to a formed membrane by providing a resolution chamber partitioned with multiaperture electrodes for plasma drawing-out control which are formed of a porous plate or the like, at the plasma drawing-out port of plasma production chamber.” In other words, in Nakahigashi's ECR reactor, the multiaperture electrodes 13 are purposely positioned in contact with the plasma in order to reduce the deposition of contaminants in the process chamber 6. Therefore, it is self-evident that if the nozzles 106 of Fairbairn, which are positioned radially around a perimeter of the process chamber, were substituted for the multiaperture electrodes 13 of Nakahigashi, the nozzles 106 of Fairbairn would not be able to act as a shield and the deposition of contaminants in the process chamber 6 would increase, which obviously defeats the intended purpose of Nakahigashi's ECR reactor. Thus, one skilled in the art would evidently not be motivated to modify Nakahigashi's ECR reactor and combine the teachings of Nakahigashi, Koshimizu and Fairbairn in the manner proposed by the Office Action. Accordingly, Applicant respectfully submits that the combination of Nakahigashi, Koshimizu and Fairbairn fails to present a *prima facie* case of obviousness.

Claims 64-65 are patentable over the cited portions Nakahigashi, Koshimizu and Fairbairn at least by virtue of their dependency from claim 53 and for the features recited therein. Specifically, claims 64-65 are patentable over the cited portions of Nakahigashi, Koshimizu and Fairbairn at least because these claims recite a plasma processing apparatus comprising, *inter alia*, “a gas introducing portion configured to introduce a gas into the process chamber, said gas introducing portion being formed in an annular ring shape;...wherein said gas introducing portion includes: an inlet port through which the gas is introduced into said gas introducing portion; an outlet port through which the gas is

evacuated from said introducing portion by said vacuum device; a gas passage provided in said gas introducing portion and connected to said inlet port and said outlet port, said gas passage being formed as an annular passage; and a plurality of gas nozzles connected to said gas passage, said gas nozzles being entirely formed as second gas passages extending within the gas introducing portion.” For at least similar reasons as provided above for claim 46, Applicant respectfully submits that the combination of Nakahigashi, Koshimizu and Fairbairn fails to present a *prima facie* case that renders claims 64-65 obvious.

Accordingly, reconsideration and withdrawal of the rejection of claims 47, 49, 54, 56, and 60-65 under 35 U.S.C. §103(a) based on Nakahigashi, or alternatively, over Nakahigashi in view of Koshimizu, as applied to claims 46 and 53 above, and further in view of U.S. Fairbairn are respectfully requested.

Claims 50 and 57 were rejected under 35 U.S.C. §103(a) as being unpatentable over Nakahigashi, or alternatively, over Nakahigashi in view of Koshimizu, as applied to claims 46 and 53 above, and further in view of Tei *et al.* (U.S. Pat. No. 2002/0011215) (hereinafter “Tei”). The rejection is respectfully traversed.

Claims 50 and 57 are patentable over Nakahigashi, Koshimizu and any combination thereof at least by virtue of their dependency from claims 46 and 53, respectively, and for the additional features recited therein.

Koshimizu is discussed above. Tei discloses a plasma processing apparatus configured to treat the surface of an optical part having a non-planar surface. *See* Tei at FIG. 1. The apparatus includes a non-planar dielectric plate 106 disposed adjacent the optical part. *Id.* A plasma is produced in the region A between the plate 106 and the optical part. *See* Tei at paragraph 85.

With this said, the cited portions of Tei do not disclose, teach or suggest a plasma processing apparatus comprising, *inter alia*, “a gas introducing portion configured to introduce a gas into the process chamber, said gas introducing portion being formed in an annular ring shape;...wherein said gas introducing portion includes: an inlet port through which the gas is introduced into said gas introducing portion; an outlet port through which the gas is evacuated from said introducing portion by said second vacuum device; a gas passage provided in said gas introducing portion and connected to said inlet port and said outlet port, said gas passage being formed as an annular passage; and a plurality of gas nozzles connected to said gas passage, said gas nozzles being entirely formed as second gas passages extending within the gas introducing portion,...” Accordingly, any proper combination of the cited

portions of Nakahigashi, Koshimizu and Tei cannot result, in any way, in the invention of claims 50 and 57.

It is also respectfully submitted that the combination of Koshimizu and Tei fails to disclose, teach or suggest each and every feature recited in claims 50 and 57. For example, neither Koshimizu nor Tei discloses, teaches or suggests “a gas exhaust line connecting said gas introducing portion to said second vacuum device, wherein said gas introducing portion includes: an inlet port through which the gas is introduced into said gas introducing portion; an outlet port through which the gas is evacuated from said introducing portion by said second vacuum device; a gas passage provided in said gas introducing portion and connected to said inlet port and said outlet port; and a plurality of gas nozzles connected to said gas passage, wherein said gas exhaust line is directly connected to said outlet port of said gas introducing portion.” The plasma apparatus of Tei merely discloses a flat antenna having a plurality of slits.

Accordingly, reconsideration and withdrawal of the rejection of claims 50 and 57 under 35 U.S.C. §103(b) as allegedly being unpatentable based on Nakahigashi, or in the alternative, based on Nakahigashi in view of Koshimizu in view of Tei are respectfully requested.

All matters having been addressed and in view of the foregoing, Applicant respectfully requests the entry of this Amendment, the Examiner’s reconsideration of this application, and the immediate allowance of all pending claims.

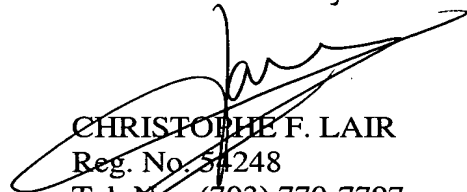
Applicant’s Counsel remains ready to assist the Examiner in any way to facilitate and expedite the prosecution of this matter. Please charge any fees associated with the submission of this paper to Deposit Account Number 033975, Order No. 040258-0279274.

HONGO *et al.* -- 09/815,305
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The Commissioner for Patents is also authorized to credit any over payments to the above-referenced Deposit Account.

Respectfully submitted,

PILLSBURY WINTHROP SHAW PITTMAN LLP



CHRISTOPHE F. LAIR
Reg. No. 54248
Tel. No. (703) 770-7797
Fax No. (703) 770-7901

ERH/CFL/pj
P.O. Box 10500
McLean, VA 22102
(703) 770-7900